RADIO TEST REPORT

FCC ID	:	LDK603102338
Equipment	:	Cisco Webex Board Pro 55
Brand Name	:	Cisco
Model Name	:	TTC60-31
Applicant	:	Cisco Systems Inc. 125 West Tasman Drive, San Jose, CA 95134-1706 , USA
Manufacturer	:	Cisco Systems Norway AS Philip Pedersens vei 1, 1366 Lysaker, Norway
Standard	:	47 CFR FCC Part 15 Subpart C § 15.249

The product was received on Mar. 10, 2021, and testing was started from Jul. 03, 2021 and completed on Sep. 23, 2021. We, Sporton International Inc. Hsinchu Laboratory, would like to declare that the tested sample has been evaluated in accordance with the procedures given in ANSI C63.10-2013, 47 CFR FCC Part 15 Subpart C and shown compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of Sporton International Inc. Hsinchu Laboratory, the test report shall not be reproduced except in full.

Approved by: Sam Chen

Sporton International Inc. Hsinchu Laboratory
No.8, Ln. 724, Bo'ai St., Zhubei City, Hsinchu County 302010, Taiwan (R.O.C.)

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History of this test report

Report No.	Version	Description	Issued Date
FR122660	01	Initial issue of report	Oct. 04, 2021
FR122660	02	Revising summary of test result	Oct. 06, 2021

Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
2.1	15.207	AC Power Line Conducted Emissions	PASS	Note
2.2	15.249(a)	Field Strength of Fundamental Emissions	PASS	-
2.3	15.215(c)	20dB Spectrum Bandwidth	PASS	-
2.4	15.249(a)/(d)	Radiated Emissions	PASS	-
2.5	15.249(d)	Band Edge Emissions	PASS	-
2.6	15.203	Antenna Requirements	PASS	-
Note: The unintentional signal is meet part 15 class A requirement, the reference standard clause is 15.107.				

Declaration of Conformity:
The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers.
Comments and Explanations:
1. The test configuration, test mode and test software were written in this test report are declared by the manufacturer. 2. The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.

Reviewed by: Sam Chen

Report Producer: Viola Huang

1 General Information

1.1 Product Details

Items	Description
Power Type	From AC power
Modulation	FMCW
Frequency Range	24000 ~ 24250 MHz
Operation Frequency Range	24060 ~ 24240 MHz
Testing Frequency	24150 MHz
Channel Bandwidth (99%)	180.17 MHz
Max. Field Strength	86.95 dBuV/m at 3m(Average) / 96.54 dBuV/m at 1m (Average)
Accessories	N/A

Note: The above information was declared by manufacturer.

1.2 Antenna Information

Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)
1	N/A	N/A	Integrated Antenna	N/A	2

Note: The above information was declared by manufacturer.

1.3 Table for Test Modes

The following table is a list of the test modes shown in this test report.

Test Items	Mode
AC Power Line Conducted Emissions Test Voltage: 120Vac / 60Hz	CTX
Field Strength of Fundamental Emissions 20dB Spectrum Bandwidth	CTX
Radiated Emissions 30MHz~1GHz	CTX
Radiated Emissions 1GHz~40GHz	CTX
Radiated Emissions 40GHz~100GHz	CTX
Band Edge Emissions	CTX

Note: CTX=continuously transmitting

1.4 Applicable Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- ANSI C63.10-2013
- 47 CFR FCC Part 15 Subpart C

The following reference test guidance is not within the scope of accreditation of TAF.

- FCC KDB 414788 D01 v01r01

1.5 Table for Testing Locations

Testing Location Information	
Test Lab.：Sporton International Inc. Hsinchu Laboratory	
Hsinchu (TAF: 3787)	ADD: No.8, Ln. 724, Bo'ai St., Zhubei City, Hsinchu County 302010, Taiwan (R.O.C.) TEL: 886-3-656-9065 FAX: 886-3-656-9085 Test site Designation No. TW3787 with FCC. Conformity Assessment Body Identifier (CABID) TW3787 with ISED.

Test Condition	Test Site No.	Test Engineer	Test Environment (°C / %)	Test Date
Radiated (Below 1GHz)	10CH01-CB	Bruce Yang	24.2~26.1 / 55~58	Sep. 23, 2021
Radiated (Above 1GHz)	10CH01-CB	Eddie Weng	24.2~26.1 / 55~58	Jul. 17, 2021
AC Conduction	CO01-CB	Peter Wu	23~24 / 58~59	Sep. 15, 2021

1.6 Table for Supporting Units

For AC Conduction

No.	Support Unit	Brand	Model	FCC ID
A	Flash disk3.0	Transcend	JetFlash-700	N/A

For Radiated (Below 1GHz)

No.	Support Unit	Brand	Model	FCC ID
A	Notebook	DELL	E4300	N/A
B	Flash disk3.0	Silicon Power	B06	N/A
C	Earphone	e-Power	S90W	N/A

For Radiated (Above 1GHz)

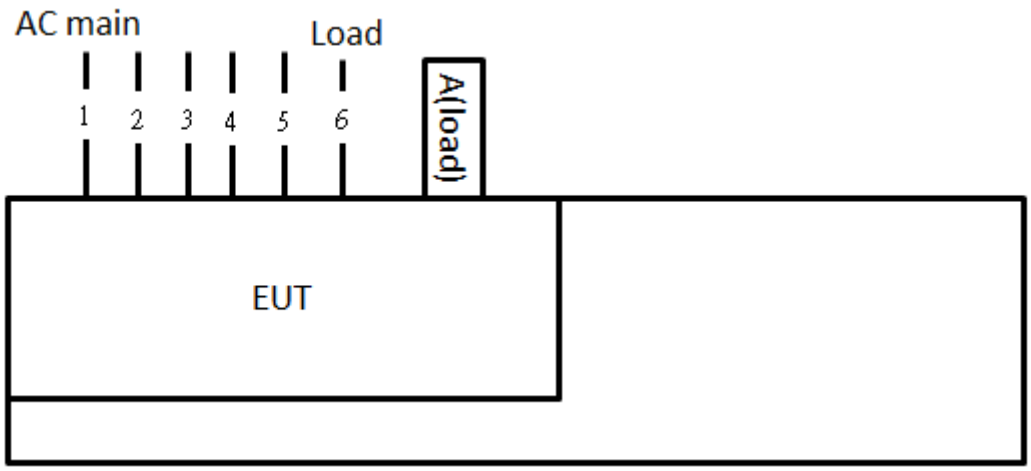
No.	Support Unit	Brand	Model	FCC ID
A	Notebook	DELL	E4300	N/A

1.7 Duty Cycle

DC	DCF(dB)	T(s)	VBW(Hz) ≥ 1/T
0.023	16.38	2.3125m	10K

1.8 Test Configurations

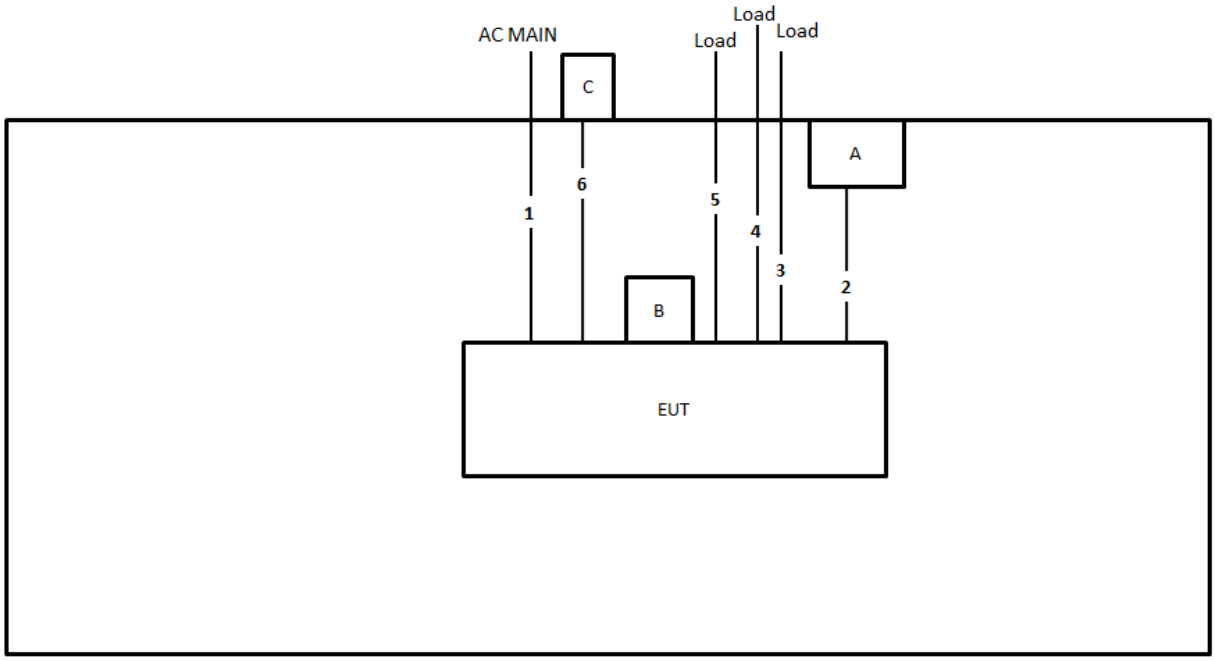
1.8.1 AC Power Line Conduction Emissions Test Configuration



Item	Connection	Shielded	Length
1	Power cable	No	3.1m
2	HDMI cable*2	Yes	1.8m
3	TypeC USB cable	Yes	1.8m
4	Micro USB cable	Yes	1.8m
5	Audio cable*3	No	3m
6	RJ-45 cable*2	No	2m

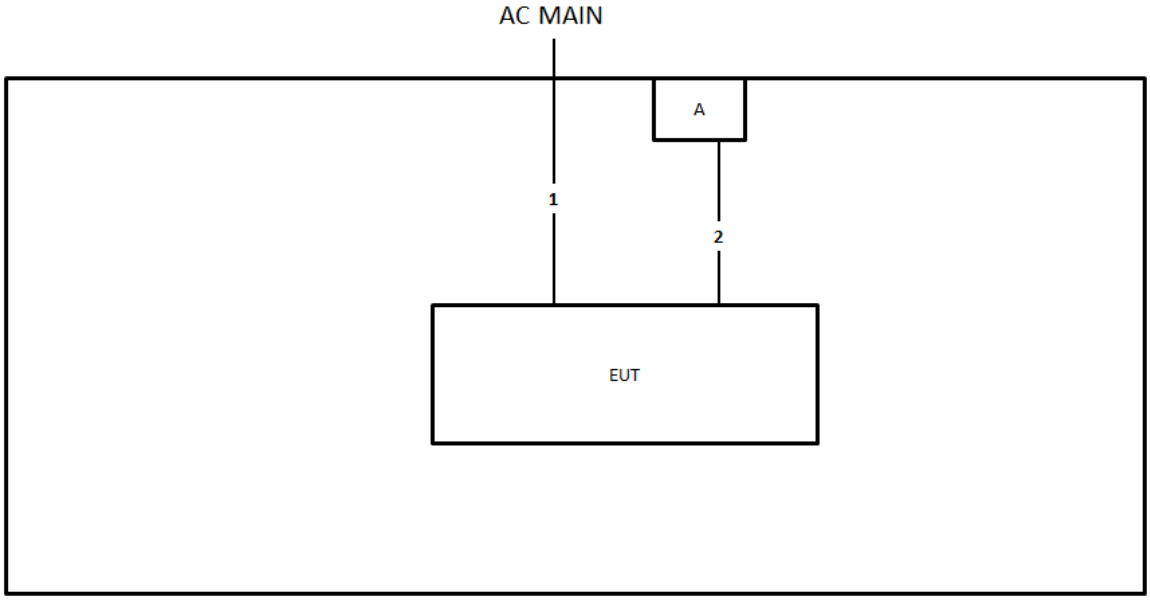
1.8.2 Radiation Emissions Test Configuration

Test Configuration: 30MHz~1GHz



Item	Connection	Shielded	Length
1	Power cable	No	1.5m
2	USB to Micro cable	Yes	0.5m
3	RJ-45 cable*2	No	1m
4	HDMI Cable*2	Yes	1.8m
5	USB to TypeC cable	Yes	0.5m
6	Audio cable	No	1.1m

Test Configuration: Above 1GHz



Item	Connection	Shielded	Length
1	Power cable	No	1.5m
2	USB to Micro cable	Yes	0.5m

2 Test Result

2.1 AC Power Line Conducted Emissions Measurement

2.1.1 Limit

For this product which is designed to be connected to the AC power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed below limits table.

Class B

Frequency (MHz)	QP Limit (dBuV)	AV Limit (dBuV)
0.15~0.5	66~56	56~46
0.5~5	56	46
5~30	60	50

Class A

Frequency (MHz)	QP Limit (dBuV)	AV Limit (dBuV)
0.15~0.5	79	66
0.5~30	73	60

2.1.2 Measuring Instruments and Setting

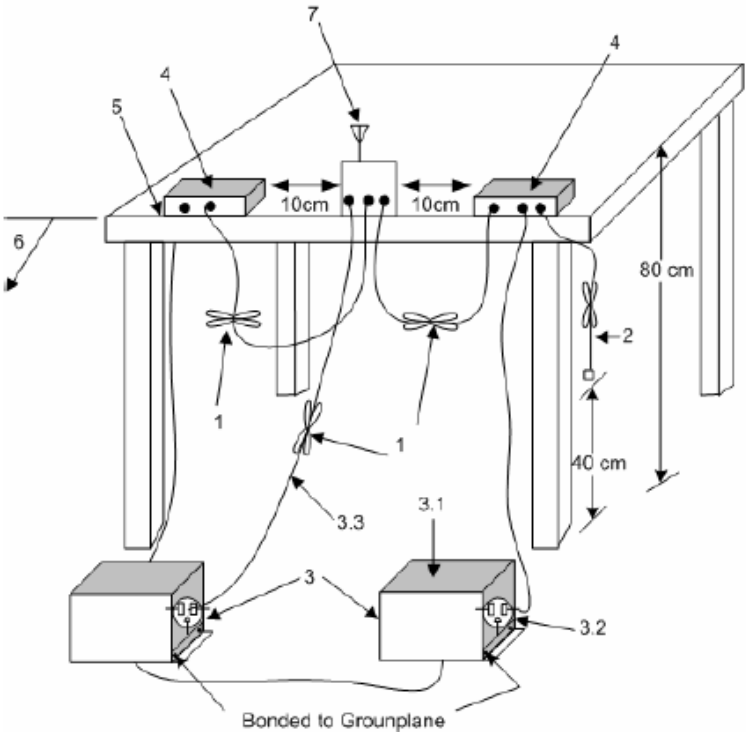
Refer a test equipment and calibration data table in this test report. The following table is the setting of the receiver.

Receiver Parameters	Setting
Attenuation	10 dB
Start Frequency	0.15 MHz
Stop Frequency	30 MHz
IF Bandwidth	9 kHz

2.1.3 Test Procedures

1. Configure the EUT according to ANSI C63.10. The EUT or host of EUT has to be placed 0.4 meter far from the conducting wall of the shielding room and at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT or host of EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connected to the other LISNs. The LISN should provide 50uH/50ohms coupling impedance.
4. The frequency range from 150 kHz to 30 MHz was searched.
5. Set the test-receiver system to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
6. The measurement has to be done between each power line and ground at the power terminal.

2.1.4 Test Setup Layout



1—Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 cm to 40 cm long.
2—The I/O cables that are not connected to an accessory shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
3—EUT connected to one LISN. Unused LISN measuring port connectors shall be terminated in 50 Ω loads. LISN may be placed on top of, or immediately beneath, reference ground plane.
3.1—All other equipment powered from additional LISN(s).
3.2—A multiple-outlet strip may be used for multiple power cords of non-EUT equipment.
3.3—LISN at least 80 cm from nearest part of EUT chassis.
4—Non-EUT components of EUT system being tested.
5—Rear of EUT, including peripherals, shall all be aligned and flush with edge of tabletop.
6—Edge of tabletop shall be 40 cm removed from a vertical conducting plane that is bonded to the ground plane.
7—Antenna can be integral or detachable. If detachable, then the antenna shall be attached for this test.

2.1.5 Test Deviation

There is no deviation with the original standard.

2.1.6 EUT Operation during Test

The EUT was placed on the test table and programmed in normal function.

2.1.7 Measurement Results Calculation

The measured Level is calculated using:

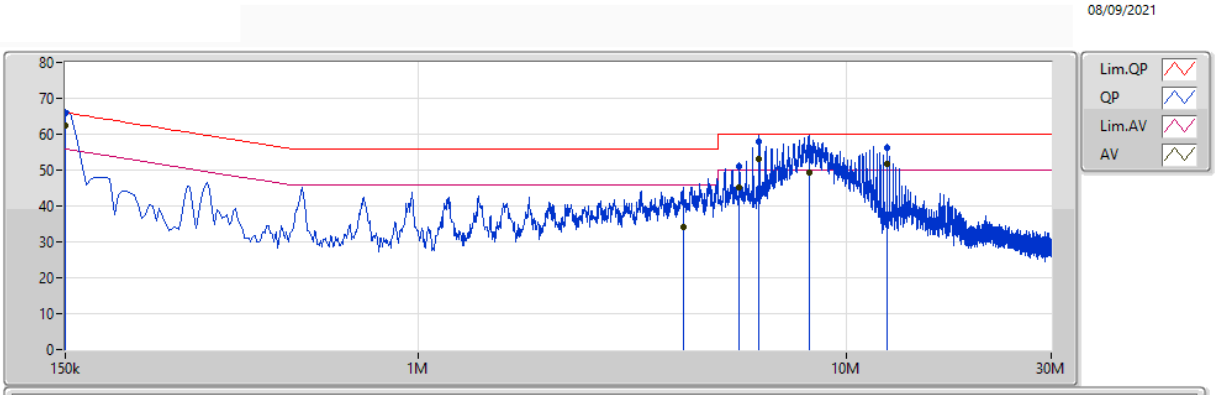
a. Corrected Reading: LISN Factor (LISN) + Attenuator (AT/AUX) + Cable Loss (CL) + Read Level (Raw) = Level

b. Margin = -Limit + Level

2.1.8 Results of AC Power Line Conducted Emissions Measurement

Configuration	CTX	Phase	Line

Class B



Type	Freq	Level	Limit	Margin	Factor	Condition	Comment	Raw	LISN	CL	AT
	(Hz)	(dBuV)	(dBuV)	(dB)	(dB)			(dBuV)	(dB)	(dB)	(dB)
QP	150k	65.97	66.00	-0.03	9.89	Line	-	56.08	0.04	0.04	9.81
AV	150k	62.34	56.00	6.34	9.89	Line	"Worst"	52.45	0.04	0.04	9.81
QP	4.151M	40.94	56.00	-15.06	10.12	Line	-	30.82	0.13	0.12	9.87
AV	4.151M	34.08	46.00	-11.92	10.12	Line	-	23.96	0.13	0.12	9.87
QP	5.609M	51.14	60.00	-8.86	10.17	Line	-	40.97	0.16	0.13	9.88
AV	5.609M	45.09	50.00	-4.91	10.17	Line	-	34.92	0.16	0.13	9.88
QP	6.252M	57.82	60.00	-2.18	10.19	Line	-	47.63	0.17	0.14	9.88
AV	6.252M	53.22	50.00	3.22	10.19	Line	-	43.03	0.17	0.14	9.88
QP	8.169M	56.21	60.00	-3.79	10.24	Line	-	45.97	0.20	0.15	9.89
AV	8.169M	49.48	50.00	-0.52	10.24	Line	-	39.24	0.20	0.15	9.89
QP	12.395M	56.12	60.00	-3.88	10.33	Line	-	45.79	0.25	0.17	9.91
AV	12.395M	51.76	50.00	1.76	10.33	Line	-	41.43	0.25	0.17	9.91

Note: The frequency 150 kHz is the unintentional signal. The unintentional signal is meet part 15 class A requirement.

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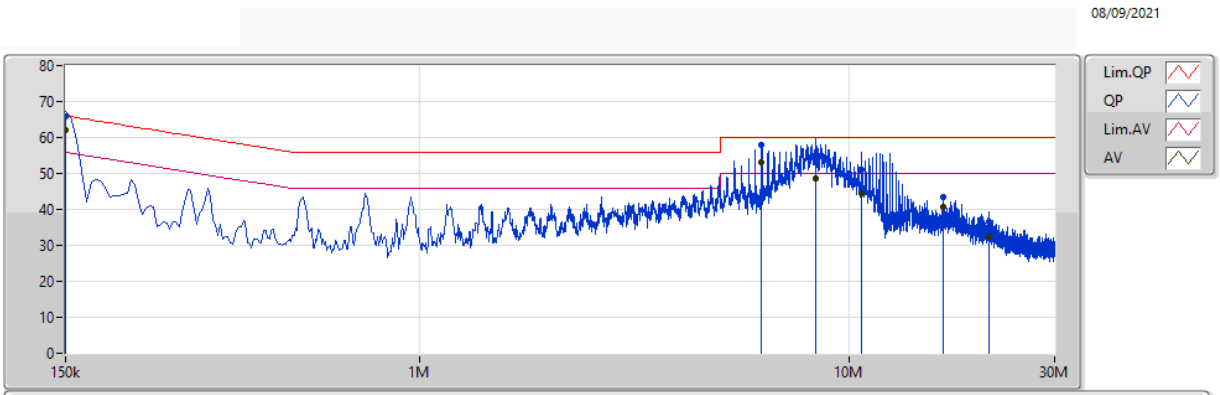
Configuration	CTX	Phase	Neutral

Class B

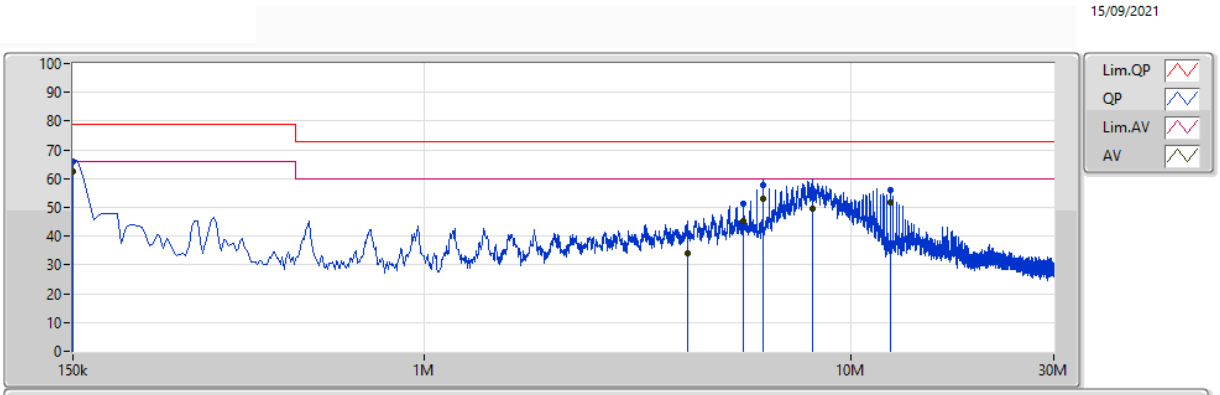


Type	Freq	Level	Limit	Margin	Factor	Condition	Comment	Raw	LISN	CL	AT
	(Hz)	(dBuV)	(dBuV)	(dB)	(dB)			(dBuV)	(dB)	(dB)	(dB)
QP	150k	65.82	66.00	-0.18	9.88	Neutral	-	55.94	0.03	0.04	9.81
AV	150k	62.24	56.00	6.24	9.88	Neutral	"Worst"	52.36	0.03	0.04	9.81
QP	6.252M	57.80	60.00	-2.20	10.17	Neutral	-	47.63	0.15	0.14	9.88
AV	6.252M	53.25	50.00	3.25	10.17	Neutral	-	43.08	0.15	0.14	9.88
QP	8.354M	55.29	60.00	-4.71	10.22	Neutral	-	45.07	0.18	0.15	9.89
AV	8.354M	48.51	50.00	-1.49	10.22	Neutral	-	38.29	0.18	0.15	9.89
QP	10.676M	51.08	60.00	-8.92	10.27	Neutral	-	40.81	0.21	0.16	9.90
AV	10.676M	44.49	50.00	-5.51	10.27	Neutral	-	34.22	0.21	0.16	9.90
QP	16.463M	43.58	60.00	-16.42	10.39	Neutral	-	33.19	0.26	0.19	9.94
AV	16.463M	40.73	50.00	-9.27	10.39	Neutral	-	30.34	0.26	0.19	9.94
QP	21.17M	36.58	60.00	-23.42	10.55	Neutral	-	26.03	0.31	0.24	10.00
AV	21.17M	32.43	50.00	-17.57	10.55	Neutral	-	21.88	0.31	0.24	10.00

Note: The frequency 150 kHz is the unintentional signal. The unintentional signal is meet part 15 class A requirement.

Configuration	CTX	Phase	Line

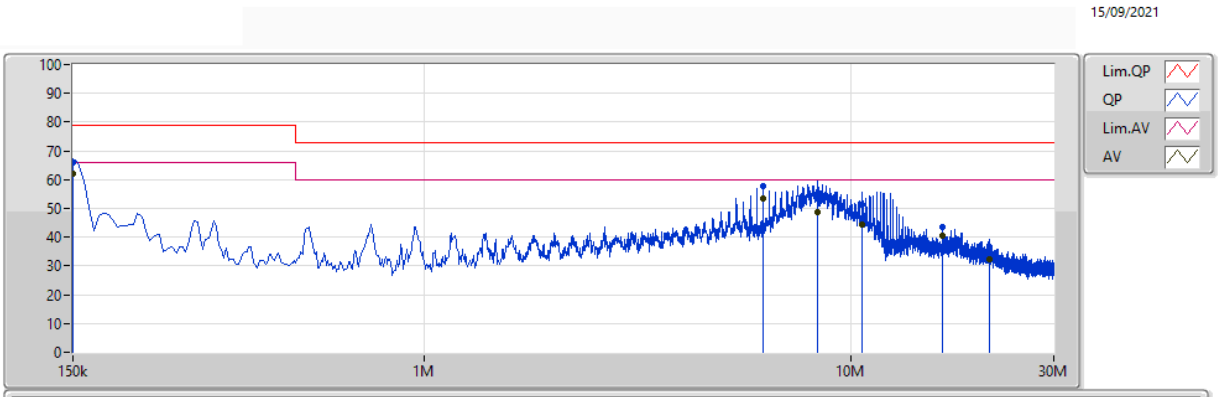
Part 15 Class A test Result



Type	Freq	Level	Limit	Margin	Factor	Condition	Comment	Raw	LISN	CL	AT
	(Hz)	(dBuV)	(dBuV)	(dB)	(dB)			(dBuV)	(dB)	(dB)	(dB)
QP	150k	65.97	79.00	-13.03	9.89	Line	-	56.08	0.04	0.04	9.81
AV	150k	62.34	66.00	-3.66	9.89	Line	"Worst"	52.45	0.04	0.04	9.81
QP	4.151M	40.94	73.00	-32.06	10.12	Line	-	30.82	0.13	0.12	9.87
AV	4.151M	34.08	60.00	-25.92	10.12	Line	-	23.96	0.13	0.12	9.87
QP	5.609M	51.14	73.00	-21.86	10.17	Line	-	40.97	0.16	0.13	9.88
AV	5.609M	45.09	60.00	-14.91	10.17	Line	-	34.92	0.16	0.13	9.88
QP	6.252M	57.82	73.00	-15.18	10.19	Line	-	47.63	0.17	0.14	9.88
AV	6.252M	53.22	60.00	-6.78	10.19	Line	-	43.03	0.17	0.14	9.88
QP	8.169M	56.21	73.00	-16.79	10.24	Line	-	45.97	0.20	0.15	9.89
AV	8.169M	49.48	60.00	-10.52	10.24	Line	-	39.24	0.20	0.15	9.89
QP	12.395M	56.12	73.00	-16.88	10.33	Line	-	45.79	0.25	0.17	9.91
AV	12.395M	51.76	60.00	-8.24	10.33	Line	-	41.43	0.25	0.17	9.91

Configuration	CTX	Phase	Neutral

Part 15 Class A test Result



Type	Freq	Level	Limit	Margin	Factor	Condition	Comment	Raw	LISN	CL	AT
	(Hz)	(dBuV)	(dBuV)	(dB)	(dB)			(dBuV)	(dB)	(dB)	(dB)
QP	150k	65.82	79.00	-13.18	9.88	Neutral	-	55.94	0.03	0.04	9.81
AV	150k	62.24	66.00	-3.76	9.88	Neutral	"Worst"	52.36	0.03	0.04	9.81
QP	6.252M	57.80	73.00	-15.20	10.17	Neutral	-	47.63	0.15	0.14	9.88
AV	6.252M	53.25	60.00	-6.75	10.17	Neutral	-	43.08	0.15	0.14	9.88
QP	8.354M	55.29	73.00	-17.71	10.22	Neutral	-	45.07	0.18	0.15	9.89
AV	8.354M	48.51	60.00	-11.49	10.22	Neutral	-	38.29	0.18	0.15	9.89
QP	10.676M	51.08	73.00	-21.92	10.27	Neutral	-	40.81	0.21	0.16	9.90
AV	10.676M	44.49	60.00	-15.51	10.27	Neutral	-	34.22	0.21	0.16	9.90
QP	16.463M	43.58	73.00	-29.42	10.39	Neutral	-	33.19	0.26	0.19	9.94
AV	16.463M	40.73	60.00	-19.27	10.39	Neutral	-	30.34	0.26	0.19	9.94
QP	21.17M	36.58	73.00	-36.42	10.55	Neutral	-	26.03	0.31	0.24	10.00
AV	21.17M	32.43	60.00	-27.57	10.55	Neutral	-	21.88	0.31	0.24	10.00

2.2 Field Strength of Fundamental Emissions Measurement

2.2.1 Limit

The field strength of fundamental emissions within these bands specified at a distance of 3 meters (measurement instrumentation employing an average detector) shall comply with the following table.

Frequency Band	Fundamental Emissions Limit Average/Peak (dBuV/m) at 3m
24000 ~ 24250 MHz	107.96/127.96

Note 1: 107.96 dBuV/m rounding to 108dBuV/m and 127.96 dBuV/m rounding to 128dBuV/m

Note 2: Above 10 GHz shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade from 3m to 1m.

Distance extrapolation factor = 20 log (specific distance [3m] / test distance [1m]) (dB);

Limit line = specific limits (dBuV) + distance extrapolation factor [9.54 dB].

Average limit = 108dBuV/m + distance extrapolation factor (9.54 dB) =117.54dBuV/m.

Peak limit = 128dBuV/m + distance extrapolation factor (9.54 dB) =137.54dBuV/m.

2.2.2 Measuring Instruments and Setting

Refer a test equipment and calibration data table in this test report. The following table is the setting of the spectrum analyzer.

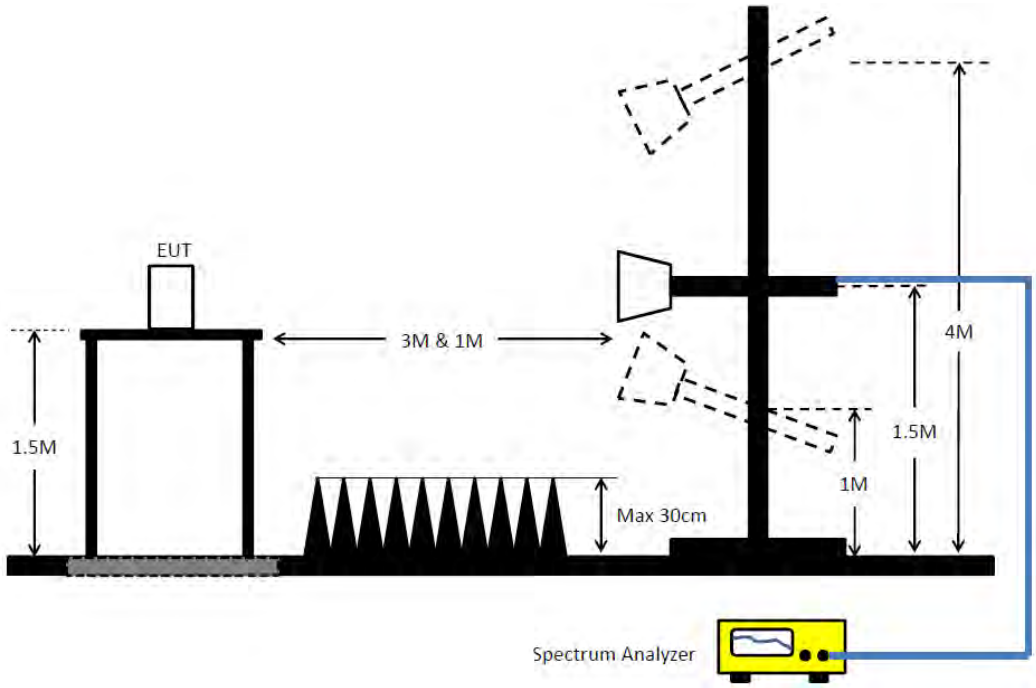
Power Meter Parameter	Setting
RBW	1 MHz Peak / 3MHz Average
VBW	1 MHz Peak / 1/T Average
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

2.2.3 Test Procedures

1. Configure the EUT according to ANSI C63.10. The EUT was placed on the top of the turntable 1.5 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
2. Power on the EUT and all the supporting units. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
3. The height of the broadband receiving antenna was varied between one meter and four meters above ground to find the maximum emissions field strength of both horizontal and vertical polarization.
4. For each suspected emissions, the antenna tower was scan (from 1 M to 4 M) and then the turntable was rotated (from 0 degree to 360 degrees) to find the maximum reading.

5. For Fundamental emissions, use 1MHz VBW and 3MHz RBW for peak reading. Then 1MHz RBW and 1/T VBW for average reading in spectrum analyzer.
6. When the radiated emissions limits are expressed in terms of the average value of the emissions, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum value.

2.2.4 Test Setup Layout



2.2.5 Test Deviation

There is no deviation with the original standard.

2.2.6 EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

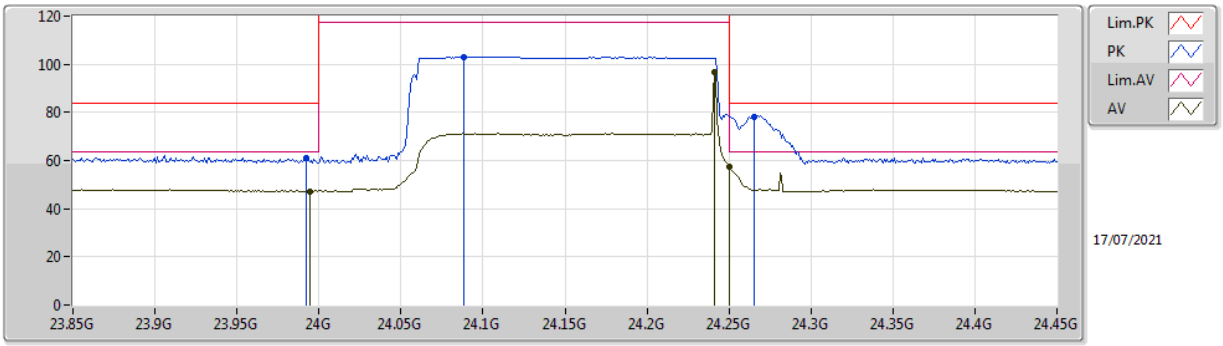
2.2.7 Measurement Results Calculation

The measured Level is calculated using:

Corrected Reading: Antenna factor (AF) + Cable loss (CL) + Read level (Raw) - Preamp factor (PA)(if applicable) = Level.

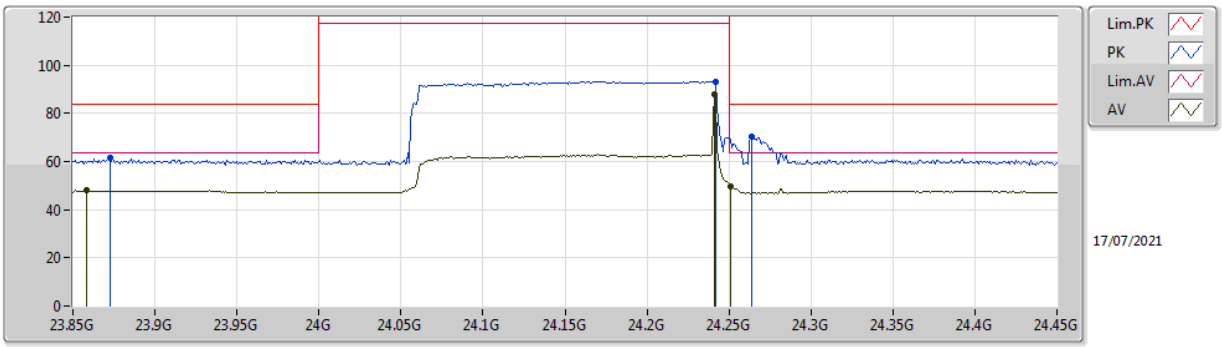
2.2.8 Test Result of Field Strength of Fundamental Emissions

Horizontal



Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comment	Raw	AF	CL	PA
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)		(dBuV)	(dB)	(dB)	(dB)
PK	23.99261G	61.04	83.54	-22.50	17.73	1	Horizontal	75	1.60	-	43.31	39.00	16.50	37.77
AV	23.99435G	47.29	63.54	-16.25	17.73	1	Horizontal	75	1.60	-	29.56	39.00	16.50	37.77
PK	24.08826G	102.91	137.54	-34.63	17.64	1	Horizontal	75	1.60	-	85.27	38.95	16.54	37.85
AV	24.2413G	96.49	117.54	-21.05	17.52	1	Horizontal	75	1.60	-	78.97	38.86	16.62	37.96
PK	24.26565G	78.26	83.54	-5.28	17.49	1	Horizontal	75	1.60	-	60.77	38.84	16.63	37.98
AV	24.25G	57.31	63.54	-6.23	17.50	1	Horizontal	75	1.60	-	39.81	38.85	16.62	37.97

Vertical



Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comment	Raw	AF	CL	PA
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)		(dBuV)	(dB)	(dB)	(dB)
PK	23.87261G	61.55	83.54	-21.99	17.78	1	Vertical	62	1.60	-	43.77	38.92	16.44	37.58
AV	23.8587G	47.96	63.54	-15.58	17.80	1	Vertical	62	1.60	-	30.16	38.92	16.43	37.55
PK	24.24217G	93.04	137.54	-44.50	17.51	1	Vertical	62	1.60	-	75.53	38.85	16.62	37.96
AV	24.2413G	88.00	117.54	-29.54	17.52	1	Vertical	62	1.60	-	70.48	38.86	16.62	37.96
PK	24.26391G	70.36	83.54	-13.18	17.49	1	Vertical	62	1.60	-	52.87	38.84	16.63	37.98
AV	24.25087G	49.75	63.54	-13.79	17.51	1	Vertical	62	1.60	-	32.24	38.85	16.63	37.97

Note:

Emission level (dBuV/m) = 20 log Emission level (uV/m).

2.3 20dB Spectrum Bandwidth Measurement

2.3.1 Limit

Intentional radiators must be designed to ensure that the 20 dB bandwidth of the emissions in the specific band (24000 ~ 24250 MHz).

2.3.2 Measuring Instruments and Setting

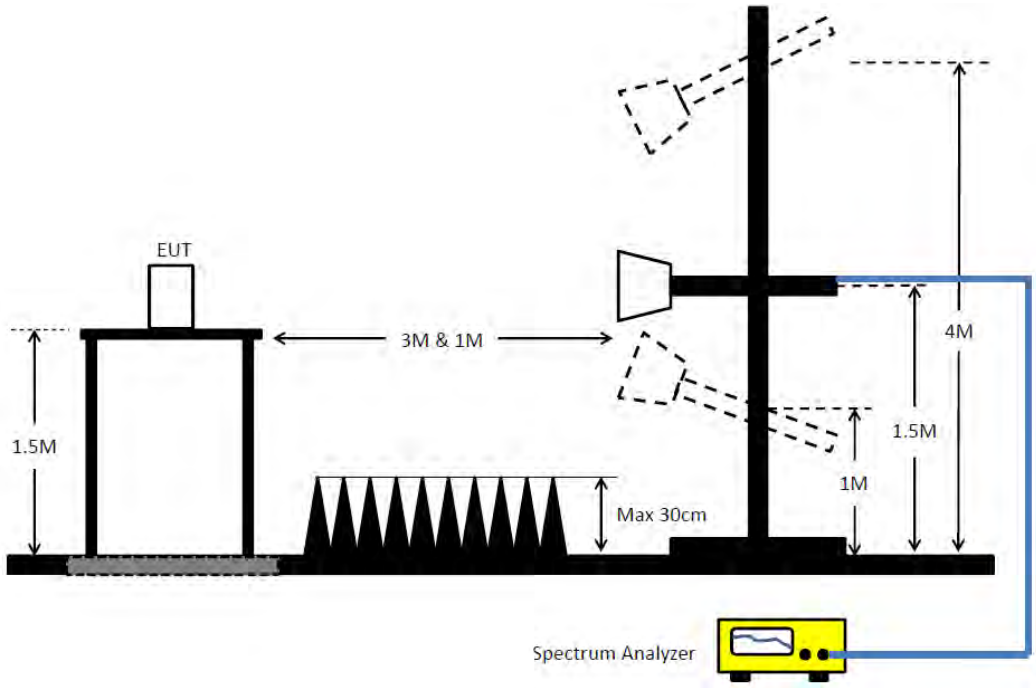
Refer a test equipment and calibration data table in this test report. The following table is the setting of the spectrum analyzer.

Spectrum Parameters	Setting
Attenuation	Auto
Span Frequency	> 20dB Bandwidth
RBW	100 kHz
VBW	100 kHz
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

2.3.3 Test Procedures

1. The test procedure is the same as section 2.4.3.
2. The resolution bandwidth of 100 kHz and the video bandwidth of 100 kHz were used.
3. Measured the spectrum width with power higher than 20dB below carrier.

2.3.4 Test Setup Layout



2.3.5 Test Deviation

There is no deviation with the original standard.

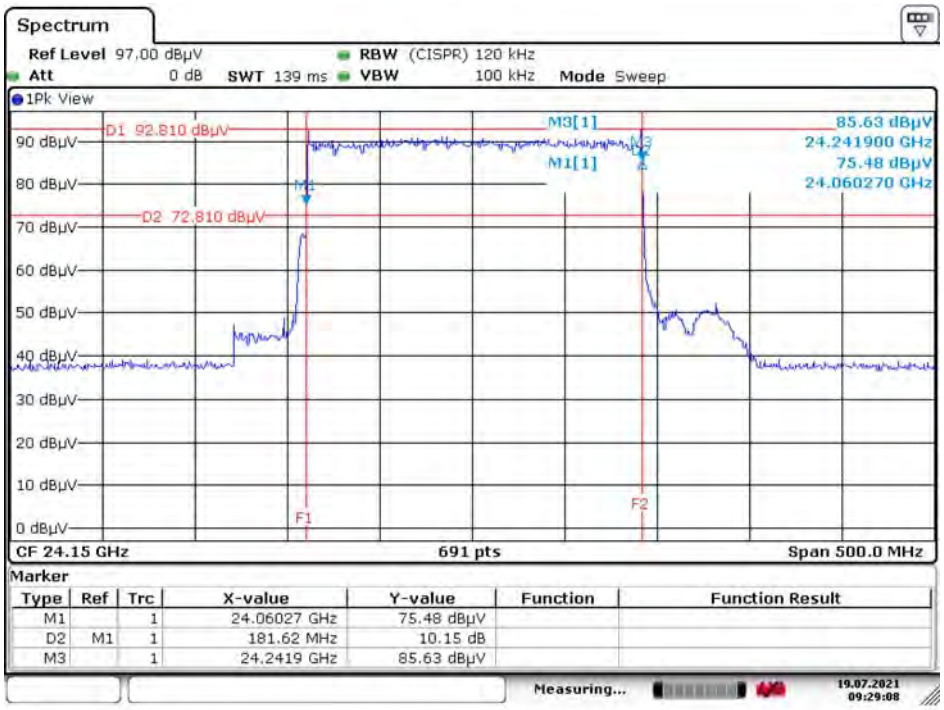
2.3.6 EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

2.3.7 Test Result of 20dB Spectrum Bandwidth

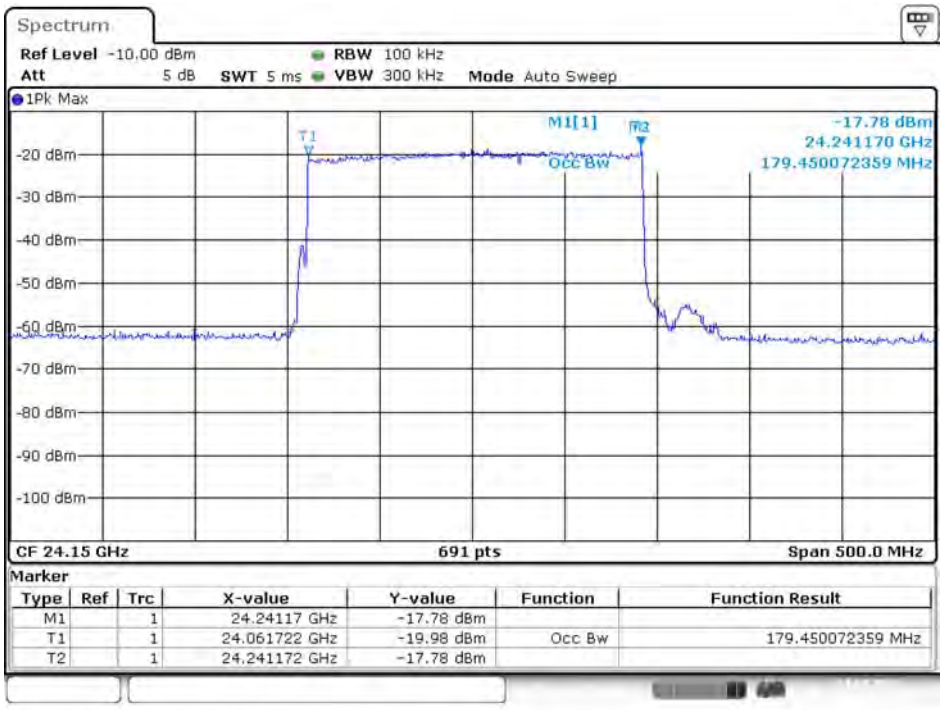
Frequency	20dB BW (MHz)	99% OBW (MHz)	Frequency range (MHz) f_L > 24000MHz	Frequency range (MHz) f_H < 24250MHz	Test Result
24150 MHz	179.45	180.17	24060.2700	24241.9000	**PASS**

20 dB Bandwidth Plot on 24150 MHz



Date: 19.JUL.2021 09:29:07

99% Bandwidth Plot on 24150 MHz



Date: 8.JUL.2021 14:45:55

2.4 Radiated Emissions Measurement

2.4.1 Limit

For 9kHz~40GHz

Harmonic emissions limits comply with below 54 dBuV/m at 3m. Other emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or comply with the radiated emissions limits specified in section 15.209(a) limit in the table below has to be followed.

Frequencies (MHz)	Field Strength (micorvolts/meter)	Measurement Distance (meters)
0.009~0.490	2400/F(kHz)	300
0.490~1.705	24000/F(kHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
Above 960	500	3

For 40GHz~100GHz

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in 47 CFR Part 15.249, whichever is the lesser attenuation.

Operating Frequencies	Harmonics Strength (micorvolts/meter)	Harmonics Strength (dBuV/m) at 3m
24000 ~ 24250 MHz	2500 at 3m	68 (Average)
24000 ~ 24250 MHz	2500 at 3m	88 (Peak)

2.4.2 Measuring Instruments and Setting

Refer a test equipment and calibration data table in this test report. The following table is the setting of the spectrum analyzer and receiver.

Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	10th carrier harmonic
RBW / VBW	1MHz / 1MHz for Peak, 1 MHz / 1/T for Average

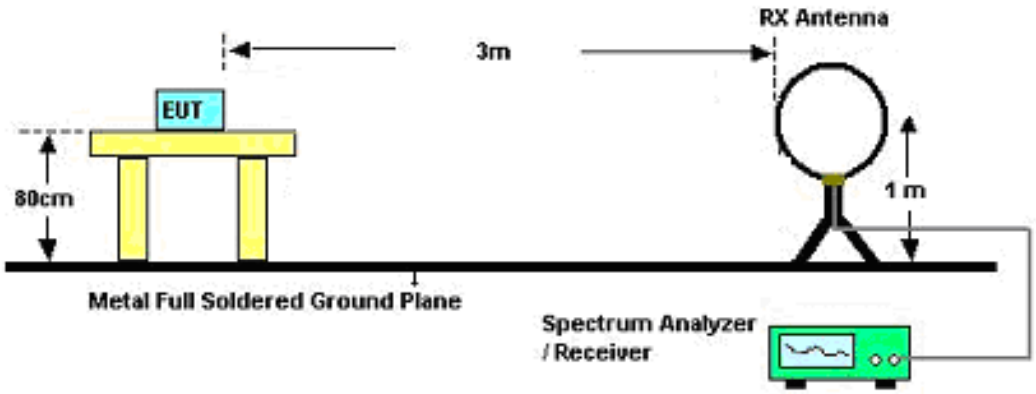
Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RBW 200Hz for QP
Start ~ Stop Frequency	150kHz~30MHz / RBW 9kHz for QP
Start ~ Stop Frequency	30MHz~1000MHz / RBW 120kHz for QP

2.4.3 Test Procedures

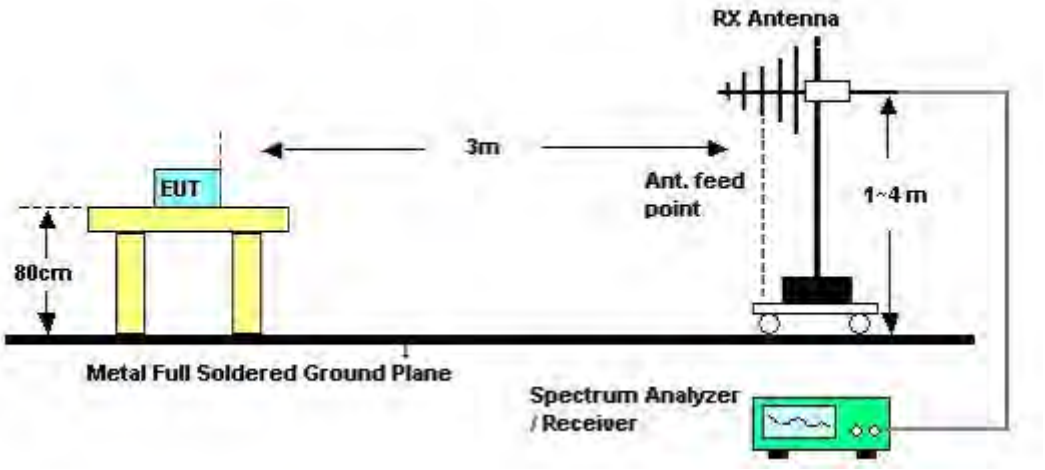
1. Configure the EUT according to ANSI C63.4. The EUT was placed on the top of the turntable 1.5 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
2. Power on the EUT and all the supporting units. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
3. The height of the broadband receiving antenna was varied between one meter and four meters above ground to find the maximum emissions field strength of both horizontal and vertical polarization.
4. For each suspected emissions, the antenna tower was scan (from 1 M to 4 M) and then the turntable was rotated (from 0 degree to 360 degrees) to find the maximum reading.
5. Set the test-receiver system to Peak or CISPR quasi-peak Detect Function with specified bandwidth under Maximum Hold Mode.
6. For emissions above 1GHz, use 1MHz VBW and RBW for peak reading. Then 1MHz RBW and 1/T VBW for average reading in spectrum analyzer.
7. When the radiated emissions limits are expressed in terms of the average value of the emissions, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum value.
8. If the emissions level of the EUT in peak mode was 3 dB lower than the average limit specified, then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions which do not have 3 dB margin will be repeated one by one using the quasi-peak method for below 1GHz.
9. For testing above 1GHz, the emissions level of the EUT in peak mode was lower than average limit (that means the emissions level in peak mode also complies with the limit in average mode), then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.
10. In case the emission is lower than 30MHz, loop antenna has to be used for measurement and the recorded data should be QP measured by receiver. High – Low scan is not required in this case.

2.4.4 Test Setup Layout

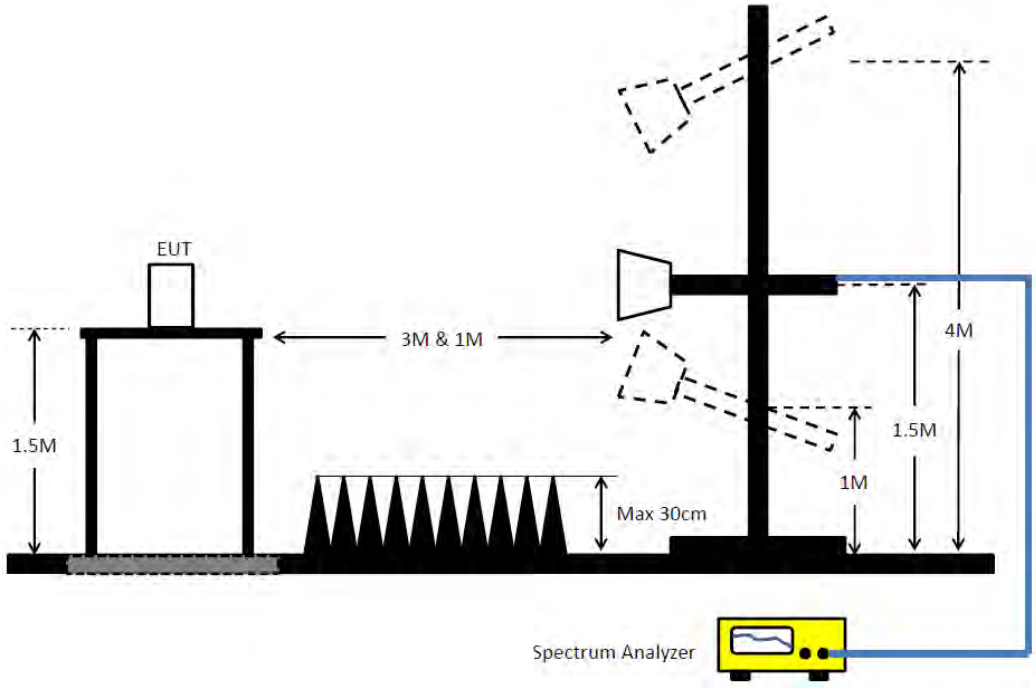
For Radiated Emissions: 9kHz ~30MHz



For Radiated Emissions: 30MHz~1GHz



For radiated emissions: 1GHz~40GHz

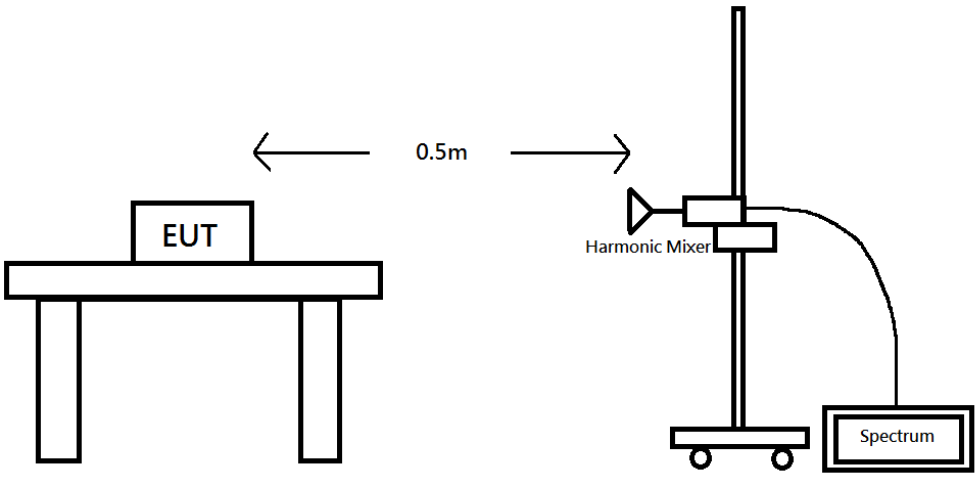


Above 10 GHz shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade from 3m to 1m.

Distance extrapolation factor = 20 log (specific distance [3m] / test distance [1m]) (dB);

Limit line = specific limits (dBuV) + distance extrapolation factor [9.54 dB].

For radiated emissions: 40GHz~100GHz



2.4.5 Test Deviation

There is no deviation with the original standard.

2.4.6 EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

2.4.7 Measurement Results Calculation

The measured Level is calculated using:

For below 40GHz

Corrected Reading: Antenna factor (AF) + Cable loss (CL) + Read level (Raw) - Preamp factor (PA)(if applicable) = Level.

For above 40GHz

EIRP = Meas. Level - RX Antenna Gain + 20*log(4*Pi(3.14159)*D/(300/(Frequency*1000)))

2.4.8 Results of Radiated Emissions (9kHz~30MHz)

Freq. (MHz)	Level (dBuV)	Over Limit (dB)	Limit Line (dBuV)	Remark
-	-	-	-	See Note

Note:

There is a comparison data of both open-field test site and alternative test site - semi-Anechoic chamber according to KDB414788 Radiated Test Site, and the result came out very similar.

The amplitude of spurious emissions which are attenuated by more than 20 dB below the permissible value has no need to be reported.

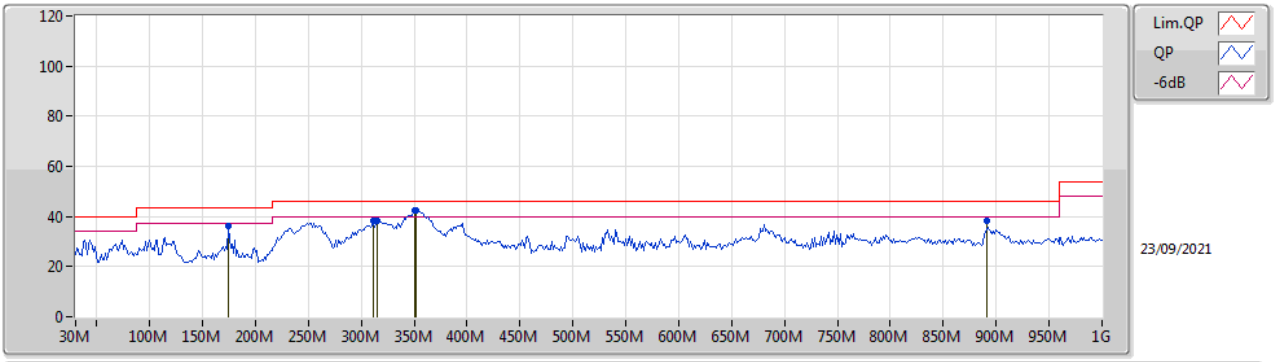
The radiated emissions were investigated from 9 kHz or the lowest frequency generated within the device, up to the 10 harmonic or 40 GHz, whichever is appropriate.

Distance extrapolation factor = 40 log (specific distance / test distance) (dB);

Limit line = specific limits (dBuV) + distance extrapolation factor.

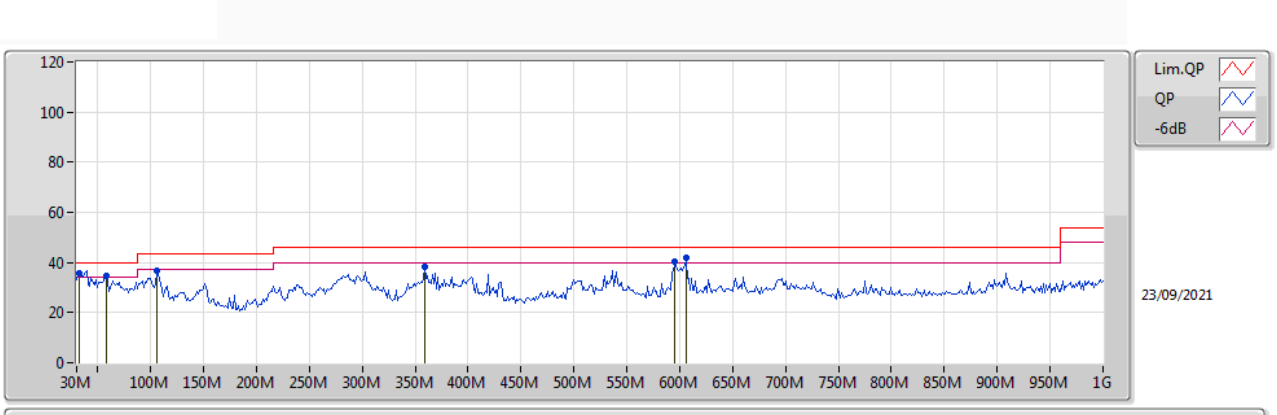
2.4.9 Results of Radiated Emissions (30MHz~1GHz)

Horizontal



Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comment	Raw	AF	CL	PA
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)		(dBuV)	(dB)	(dB)	(dB)
PK	174.82M	36.15	43.50	-7.35	-9.56	3	Horizontal	2	1.00	-	45.71	15.16	3.42	28.14
PK	311.18M	38.03	46.00	-7.97	-4.76	3	Horizontal	355	1.25	-	42.79	19.25	3.87	27.88
PK	315.34M	38.52	46.00	-7.48	-4.66	3	Horizontal	248	1.00	-	43.18	19.36	3.89	27.91
PK	350.48M	42.21	46.00	-3.79	-3.91	3	Horizontal	60	1.00	-	46.12	20.11	4.10	28.12
PK	351.91M	42.22	46.00	-3.78	-3.85	3	Horizontal	315	1.25	"Worst"	46.07	20.18	4.11	28.14
PK	891.7M	38.15	46.00	-7.85	3.45	3	Horizontal	348	1.50	-	34.70	25.61	6.58	28.74

Vertical



Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comment	Raw	AF	CL	PA
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)		(dBuV)	(dB)	(dB)	(dB)
PK	32.85M	35.78	40.00	-4.22	-4.72	3	Vertical	180	1.25	"Worst"	40.50	22.65	1.11	28.48
PK	58.16M	34.75	40.00	-5.25	-14.62	3	Vertical	143	1.00	-	49.37	12.20	1.66	28.48
PK	105.88M	36.88	43.50	-6.62	-8.73	3	Vertical	242	1.00	-	45.61	17.18	2.49	28.40
PK	358.88M	38.52	46.00	-7.48	-3.77	3	Vertical	88	1.25	-	42.29	20.30	4.14	28.21
PK	595.15M	40.22	46.00	-5.78	0.13	3	Vertical	360	1.50	-	40.09	24.09	5.37	29.33
PK	606.38M	41.76	46.00	-4.24	0.16	3	Vertical	360	1.00	-	41.60	24.05	5.43	29.32

Note:

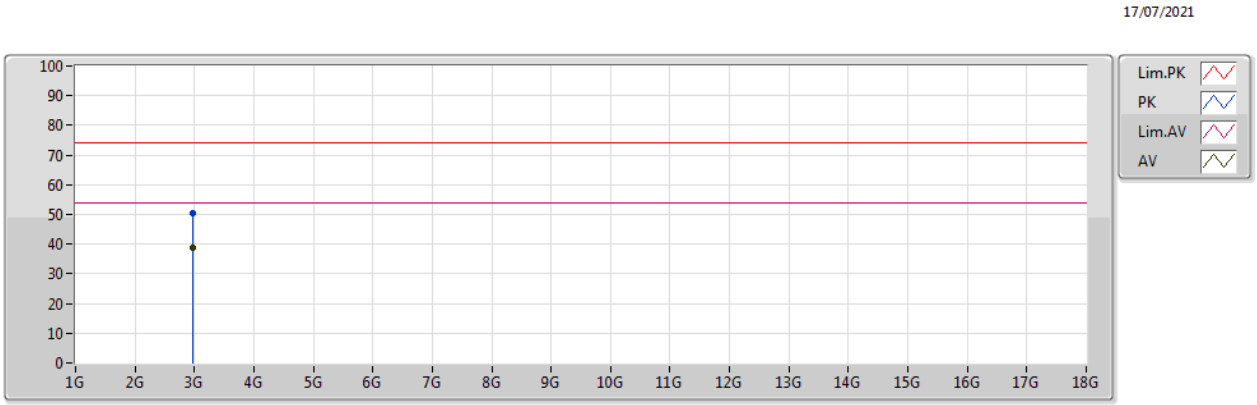
The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

Emission level (dBuV/m) = 20 log Emission level (uV/m).

2.4.10 Results for Radiated Emissions (1GHz~40GHz)

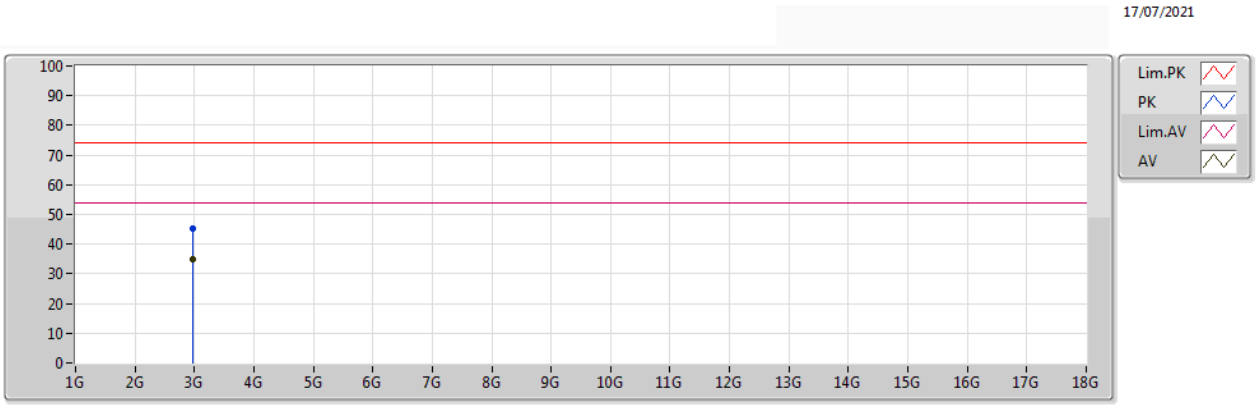
Frequency	1~18G

Horizontal



Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comment	Raw	AF	CL	PA
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)		(dBuV/m)	(dB/m)	(dB)	(dB)
AV	2.96914G	38.95	54.00	-15.05	3.11	3	Horizontal	165	1.60	-	35.84	32.61	6.77	36.27
PK	2.96912G	50.42	74.00	-23.58	3.11	3	Horizontal	165	1.60	-	47.31	32.61	6.77	36.27

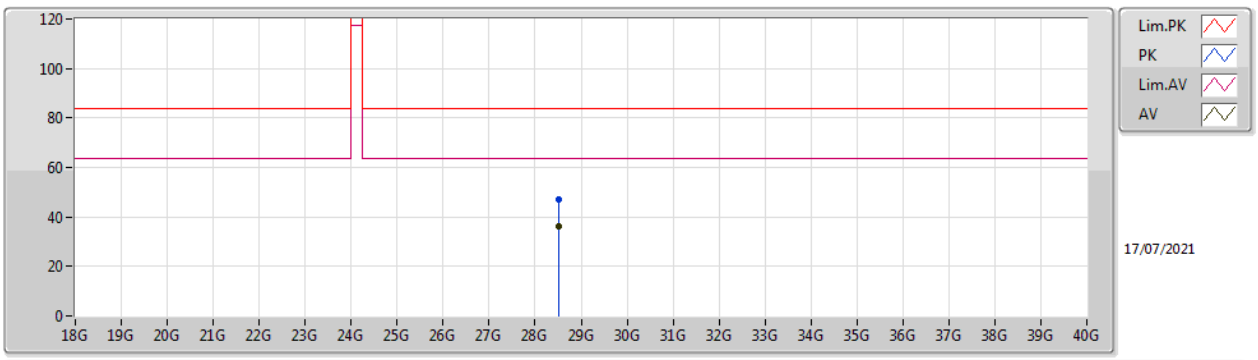
Vertical



Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comment	Raw	AF	CL	PA
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)		(dBuV/m)	(dB/m)	(dB)	(dB)
AV	2.96935G	35.03	54.00	-18.97	3.12	3	Vertical	177	1.60	-	31.91	32.62	6.77	36.27
PK	2.97682G	45.12	74.00	-28.88	3.17	3	Vertical	177	1.60	-	41.95	32.66	6.78	36.27

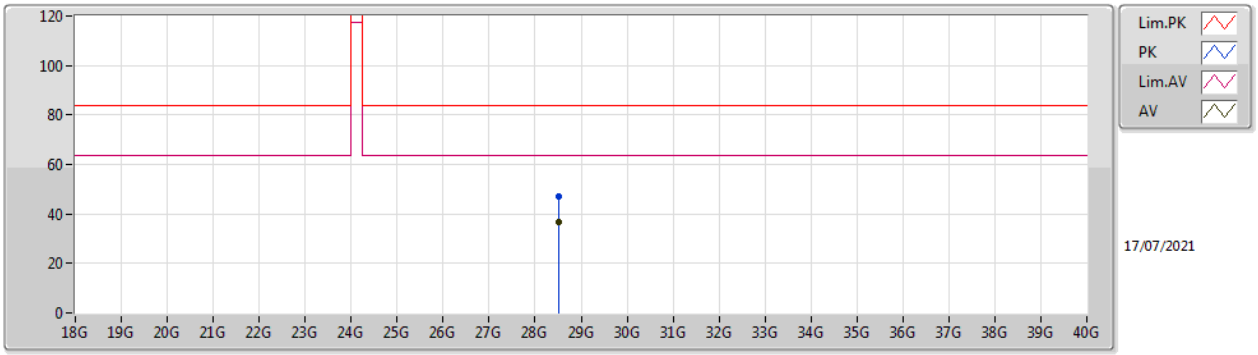
Frequency	18~40G

Horizontal



Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comment	Raw	AF	CL	PA
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)		(dBuV)	(dB)	(dB)	(dB)
PK	28.51837G	46.97	83.54	-36.57	17.24	1	Horizontal	63	1.60	-	29.73	39.71	17.99	40.46
AV	28.51962G	36.17	63.54	-27.37	17.25	1	Horizontal	63	1.60	-	18.92	39.72	17.99	40.46

Vertical



Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comment	Raw	AF	CL	PA
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)		(dBuV)	(dB)	(dB)	(dB)
PK	28.52416G	47.10	83.54	-36.44	17.26	1	Vertical	78	1.60	-	29.84	39.72	17.99	40.45
AV	28.51501G	36.69	63.54	-26.85	17.24	1	Vertical	78	1.60	-	19.45	39.71	17.99	40.46

Note:

The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

Emission level (dBuV/m) = 20 log Emission level (uV/m).

2.4.11 Results for Radiated Emissions (40GHz~100GHz)

Frequency (GHz)	Measurement Distance (m)	Measurement Peak (dBm)	Rx Antenna Gain (dBi)	Measurement EIRP (dBm)	Measurement Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)
48.312	1	-82.03	24	-39.91	64.909	117.50	-52.59
Frequency (GHz)	**Measurement Distance (m)**	**Measurement Average (dBm)**	**Rx Antenna Gain (dBi)**	**Measurement EIRP (dBm)**	**Measurement Level (dBuV/m)**	**Limit (dBuV/m)**	**Margin (dB)**
48.320	1	-93.10	24	-50.98	53.840	97.50	-43.66

Distance extrapolation factor = 20 log (specific distance [3m] / test distance [1m]) (dB);

Limit line = specific limits (dBuV) + distance extrapolation factor [9.54 dB].

EIRP = PT * GT = (PR / GR) * (4 * Pi * D / λ)^2

2.5 Band Edge Emissions Measurement

2.5.1 Limit

Band edge emissions radiated outside of the specified frequency bands shall be attenuated by at least 50 dB below the level of the fundamental or comply with the radiated emissions limits specified in section 15.209(a) limit in the table below has to be followed.

Frequencies (MHz)	Field Strength (micorvolts/meter)	Measurement Distance (meters)
0.009~0.490	2400/F(kHz)	300
0.490~1.705	24000/F(kHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
Above 960	500	3

2.5.2 Measuring Instruments and Setting

Refer a test equipment and calibration data table in this test report. The following table is the setting of the spectrum analyzer.

Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	100 MHz
RBW / VBW	1MHz / 1MHz for Peak, 1 MHz / 1/T for Average

2.5.3 Test Procedures

The test procedure is the same as section 2.4.3.

2.5.4 Test Setup Layout

This test setup layout is the same as that shown in section 2.4.4

2.5.5 Test Deviation

There is no deviation with the original standard.

2.5.6 EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

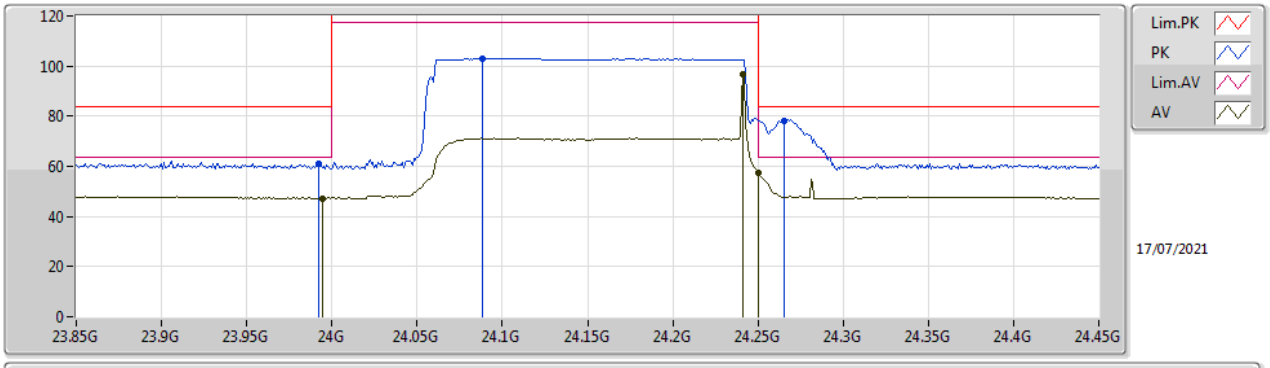
2.5.7 Measurement Results Calculation

The measured Level is calculated using:

Corrected Reading: Antenna factor (AF) + Cable loss (CL) + Read level (Raw) - Preamp factor (PA)(if applicable) = Level.

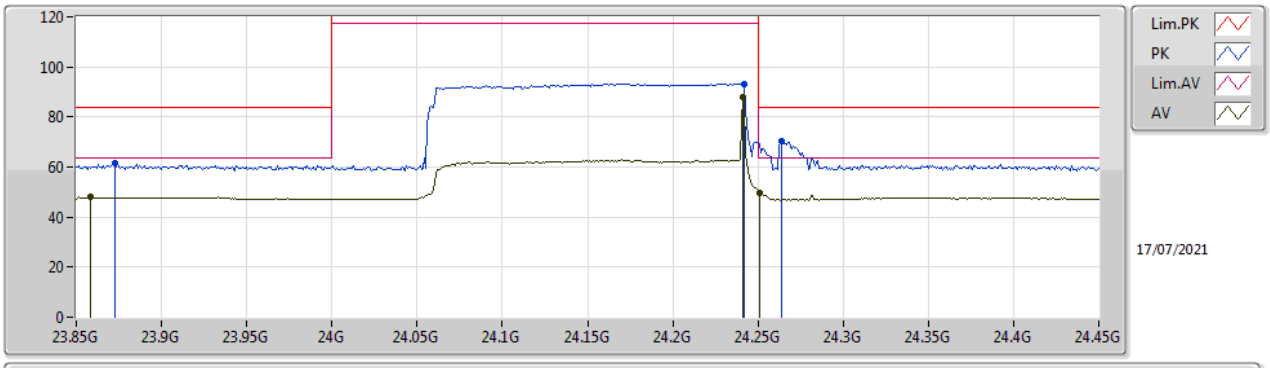
2.5.8 Test Result of Band Edge and Fundamental Emissions

Horizontal



Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comment	Raw	AF	CL	PA
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)		(dBuV)	(dB)	(dB)	(dB)
PK	23.99261G	61.04	83.54	-22.50	17.73	1	Horizontal	75	1.60	-	43.31	39.00	16.50	37.77
AV	23.99435G	47.29	63.54	-16.25	17.73	1	Horizontal	75	1.60	-	29.56	39.00	16.50	37.77
PK	24.08826G	102.91	137.54	-34.63	17.64	1	Horizontal	75	1.60	-	85.27	38.95	16.54	37.85
AV	24.2413G	96.49	117.54	-21.05	17.52	1	Horizontal	75	1.60	-	78.97	38.86	16.62	37.96
PK	24.26565G	78.26	83.54	-5.28	17.49	1	Horizontal	75	1.60	-	60.77	38.84	16.63	37.98
AV	24.25G	57.31	63.54	-6.23	17.50	1	Horizontal	75	1.60	-	39.81	38.85	16.62	37.97

Vertical



Type	Freq	Level	Limit	Margin	Factor	Dist	Condition	Azimuth	Height	Comment	Raw	AF	CL	PA
	(Hz)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	(m)		(°)	(m)		(dBuV)	(dB)	(dB)	(dB)
PK	23.87261G	61.55	83.54	-21.99	17.78	1	Vertical	62	1.60	-	43.77	38.92	16.44	37.58
AV	23.8587G	47.96	63.54	-15.58	17.80	1	Vertical	62	1.60	-	30.16	38.92	16.43	37.55
PK	24.24217G	93.04	137.54	-44.50	17.51	1	Vertical	62	1.60	-	75.53	38.85	16.62	37.96
AV	24.2413G	88.00	117.54	-29.54	17.52	1	Vertical	62	1.60	-	70.48	38.86	16.62	37.96
PK	24.26391G	70.36	83.54	-13.18	17.49	1	Vertical	62	1.60	-	52.87	38.84	16.63	37.98
AV	24.25087G	49.75	63.54	-13.79	17.51	1	Vertical	62	1.60	-	32.24	38.85	16.63	37.97

2.6 Antenna Requirements

2.6.1 Limit

Except for special regulations, the Low-power Radio-frequency Devices must not be equipped with any jacket for installing an antenna with extension cable. An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that the user can replace a broken antenna, but the use of a standard antenna jack or electrical connector is prohibited.

2.6.2 Antenna Connector Construction

The antenna connector complied with the requirements.

3 List of Measuring Equipments

Instrument	Brand	Model No.	Serial No.	Characteristics	Calibration Date	Calibration Due Date	Remark
EMI Receiver	Agilent	N9038A	My52260123	9kHz ~ 8.4GHz	Mar. 03, 2021	Mar. 02, 2022	Conduction (CO01-CB)
LISN	F.C.C.	FCC-LISN-50-16-2	04083	150kHz ~ 100MHz	Jan. 06, 2021	Jan. 05, 2022	Conduction (CO01-CB)
LISN	Schwarzbeck	NSLK 8127	8127647	9kHz ~ 30MHz	Mar. 07, 2021	Mar. 06, 2022	Conduction (CO01-CB)
Pulse Limiter	Rohde& Schwarz	ESH3-Z2	100430	9kHz ~ 30MHz	Jan. 30, 2021	Jan. 29, 2022	Conduction (CO01-CB)
COND Cable	Woken	Cable	Low cable-CO01	9kHz ~ 30MHz	May 19, 2021	May 18, 2022	Conduction (CO01-CB)
Software	SPORTON	SENSE	V5.10	-	N.C.R.	N.C.R.	Conduction (CO01-CB)
10m Semi Anechoic Chamber NSA	TDK	SAC-10M	10CH01-CB	30MHz~1GHz 10m,3m	Jan. 28, 2021	Jan. 27, 2022	Radiation (10CH01-CB)
10m Semi Anechoic Chamber VSWR	TDK	SAC-10M	10CH01-CB	1GHz ~18GHz 3m	Mar. 12, 2021	Mar. 11, 2022	Radiation (10CH01-CB)
Pre-Amplifier	Agilent	8447D	2944A10783	9kHz ~ 1.3GHz	Mar. 11, 2021	Mar. 10, 2022	Radiation (10CH01-CB)
Pre-Amplifier	Agilent	8447D	2944A10784	9kHz ~ 1.3GHz	Mar. 11, 2021	Mar. 10, 2022	Radiation (10CH01-CB)
Low Cable	Woken	SUCOFLEX 104	low cable-01	25MHz ~ 1GHz	Oct. 20, 2020	Oct. 19, 2021	Radiation (10CH01-CB)
High Cable	Woken	SUCOFLEX 104	low cable-02	25MHz ~ 1GHz	Oct. 20, 2020	Oct. 19, 2021	Radiation (10CH01-CB)
Bilog Antenna with 6dB Attenuator	Chase & EMCI	CBL6111A &N-6-06	1543 &AT-N0609	30MHz ~ 1GHz	Jul. 01, 2021	Jun. 30, 2022	Radiation (10CH01-CB)
EMI Receiver	Agilent	N9038A	MY52260140	9kHz ~ 8.4GHz	May 05, 2021	May 04, 2022	Radiation (10CH01-CB)
Spectrum Analyzer	R&S	FSP40	100056	9kHz ~ 40GHz	May 03, 2021	May 02, 2022	Radiation (10CH01-CB)
Horn Antenna	ESCO	3117	00081283	1GHz ~ 18GHz	Nov. 23, 2020	Nov. 22, 2021	Radiation (10CH01-CB)
Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170507	15GHz ~ 40GHz	Jun. 18, 2021	Jun. 17, 2022	Radiation (10CH01-CB)
Amplifier	Agilent	8449B	3008A02660	1GHz ~ 26.5GHz	May 20, 2021	May 19, 2022	Radiation (10CH01-CB)
Amplifier	-	-	TF-130N-R1	18GHz ~ 40GHz	Jun.15, 2021	Jun. 14, 2022	Radiation (10CH01-CB)
CABLE (1~40G)	TITAN	T318E	high cable-02	1GHz ~ 40GHz	Mar. 17, 2021	Mar. 16, 2022	Radiation (10CH01-CB)
RF Cable-high	Woken	RG402	High Cable-40G#1	18GHz ~ 40 GHz	Jul. 16, 2020	Jul. 15, 2021	Radiation (10CH01-CB)
RF Cable-high	Woken	RG402	High Cable-40G#1	18GHz ~ 40 GHz	Jul. 15, 2021	Jul. 14, 2022	Radiation (10CH01-CB)
Loop Antenna	Teseq	HLA 6120	24155	9kHz - 30 MHz	Apr. 14, 2021	Apr. 13, 2022	Radiation (10CH01-CB)

Mixer	OML	M19HWA	U91113-1	40 ~ 60 GHz	Nov. 02, 2020	Nov. 01, 2021	Radiation (10CH01-CB)
Mixer	OML	M12HWA	E91113-1	60 ~ 90 GHz	Nov. 14, 2020	Nov. 13, 2021	Radiation (10CH01-CB)
Mixer	OML	M08HWA	F91113-1	90 ~ 140 GHz	Nov. 02, 2020	Nov. 01, 2021	Radiation (10CH01-CB)
Standard Horn Antenna	Custom Microwave	M19RH	U91113-A	40 ~ 60 GHz	N.C.R	N.C.R	Radiation (10CH01-CB)
Standard Horn Antenna	Custom Microwave	M12RH	E91113-A	60 ~ 90 GHz	N.C.R	N.C.R	Radiation (10CH01-CB)
Standard Horn Antenna	Custom Microwave	M08RH	F91113-A	90 ~ 140 GHz	N.C.R	N.C.R	Radiation (10CH01-CB)
Test Software	SPORTON	SENSE	V5.10	-	N.C.R.	N.C.R.	Radiation (10CH01-CB)

Note: Calibration Interval of instruments listed above is one year.

N.C.R. means Non-Calibration required.

4 Measurement Uncertainty

Test Items	Uncertainty	Remark
Conducted Emission (150kHz ~ 30MHz)	2.0 dB	Confidence levels of 95%
Radiated Emission (9kHz ~ 30MHz)	1.6 dB	Confidence levels of 95%
Radiated Emission (30MHz ~ 1,000MHz)	4.2 dB	Confidence levels of 95%
Radiated Emission (1GHz ~ 40GHz)	5.0 dB	Confidence levels of 95%
Radiated Emission (40GHz ~ 60GHz)	3.6 dB	Confidence levels of 95%
Radiated Emission (60GHz ~ 90GHz)	4.2 dB	Confidence levels of 95%
Radiated Emission (90GHz ~ 200GHz)	5.1 dB	Confidence levels of 95%
Conducted Emission	2.5 dB	Confidence levels of 95%